History and Physical Examination Findings

An 8-year-old 21.5-kg (47.3-lb) castrated male Australian cattle dog was evaluated after sustaining maxillofacial trauma secondary to biting a horse. The referring veterinarian noted severe dental calculus and suspected a displaced right mandibular fracture. A temporary tape muzzle was placed, and carprofen (2.2 mg/kg [1.0 mg/lb], SC, once), hydromorphone (0.05 mg/kg [0.02 mg/lb], IV, q 6 h), and ampicillin (22.0 mg/kg [10.0 mg/lb], IV, q 8 h) were administered.

Physical examination revealed a body condition score of 5 of 9, mild hypothermia (temperature, 37.3°C [99.1°F] per rectum; reference range, 38° to 39.1°C [100.5° to 102.5°F]), bradycardia (heart rate, 60 beats/min; reference range, 60 to 120 beats/min), and respiratory rate of 18 breaths/min (reference range, 10 to 34 breaths/min). Oral examination revealed lateral luxation of the right maxillary canine tooth (Figure 1), a 12-mm-long mucogingival laceration distal to the right maxillary canine tooth, and swelling at the rostral aspect of the right side of the muzzle. No evidence of mandibular fracture or instability was noted. Thoracic radiography was performed, and findings were consistent with mild bronchopneumonia, possibly secondary to aspiration. Results of a CBC revealed 1,124 band neutrophils/µL with slight to moderate toxic changes and slight toxic changes in the mature neutrophils. There was a mild lymphopenia (756 lymphocytes/µL [reference range, 1,000 to 4,000 lymphocytes/µL]). Serum biochemical analysis revealed slightly low creatinine concentration (0.7 mg/dL [reference range, 0.8 to 1.5 mg/dL]) and slightly high creatine kinase activity (291 U/L [reference range, 55 to 257 U/L]). Urinalysis revealed mild proteinuria (75 mg/dL [reference range, 0 to 50 mg/dL]) with a urine specific gravity of 1.048. The remaining hematologic and urological values were within respective reference ranges.

The patient was hospitalized overnight for treatment with lactated Ringer’s solution (2.3 mL/kg/h [1.0 mL/lb/h], IV), ondansetron hydrochloride dihydrate (0.2 mg/kg [0.09 mg/lb], IV, q 12 h), methadone (0.5 mg/kg [0.23 mg/lb], IV, q 6 h), and ampicillin sodium–sulbactam (40.0 mg/kg [18.18 mg/lb], IV, q 8 h). The dog was anesthetized, and intraoral dental radiography and periodontal charting were performed. Selected radiographic views are provided (Figure 2).

Determine whether additional studies are required, or make your diagnosis, then turn the page →

This report was submitted by G. G. Comet Riggs, DVM, and Boaz Arzi, DVM, from the Dentistry and Oral Surgery Service, William R. Pritchard Veterinary Medical Teaching Hospital (Riggs), and the Department of Surgical and Radiological Sciences (Arzi), School of Veterinary Medicine, University of California-Davis, Davis, CA 95616.

Address correspondence to Dr. Arzi (barzi@ucdavis.edu).
Diagnostic Imaging Findings and Interpretations

Full-mouth dental radiographs revealed a root fracture of the right maxillary canine tooth and an area of decreased radiopacity consistent with external inflammatory root resorption. The pulp cavity of the affected tooth appeared wider than that of the contralateral canine tooth and inconsistent with maturity of the dog, indicating failure of the pulp cavity to narrow. The alveolus of the right maxillary canine tooth was mostly replaced by bone. In addition, the apex of the right maxillary canine tooth appeared round and irregular, compared with the contralateral canine tooth, suggesting a chronic inflammatory process. These findings were supportive of endodontal injury at an earlier age. In addition, the right maxillary canine tooth was luxated laterally and fracture of the ipsilateral maxillary and incisive bones was evident (Figure 3). In the set of full-mouth dental radiographs, mild to moderate semigeneralized periodontitis with a pattern dominated by horizontal bone loss was also seen.

Computed tomography of the skull was performed to evaluate the patient for other possible maxillofacial injuries. Gas opacities were observed within the pulp cavity and within the remaining periodontal space of the right maxillary canine tooth, consistent with acute trauma. A slightly displaced fracture of the right incisive bone was detected rostrally. Palatally, a small, slightly displaced maxillary bone fracture was seen. There was loss of bone around the root of the right maxillary canine tooth at the caudal aspect of the fracture that was not consistent with acute trauma. A separated fragment of dental tissue, thought to represent a fragment of the fractured tooth root, was observed apical to this region (Figure 4). Computed tomography further supported the radiographic findings by revealing that the right maxillary canine tooth had a blunted, irregular root and a wider than normal pulp cavity.

Treatment and Outcome

With the patient anesthetized, all teeth were sonically scaled above the gingival margin and pumice polished. A right infraorbital nerve block was performed with 0.5% bupivacaine hydrochloride solution (0.23 mg/kg [0.10 mg/lb]). The right maxillary canine tooth was surgically extracted, and the attached buccal alveolar bone and fragments of the maxillary and incisive bones were removed. Alveolectomy was performed, and the remnant of dental tissue detected on CT images was removed. On the day following surgery, the dog appeared to be comfortable and was discharged home. The owner was instructed to administer amoxicillin-clavulanic acid (17.5 mg/kg [8.0 mg/lb], PO, q 12 h) for 2 weeks, famotidine (1.0 mg/kg [0.45 mg/lb], PO, q 12 h) for 7 days, sucralfate (46.5 mg/kg [21.1 mg/lb], PO, q 8 h) for 10 days, maropitant citrate (1.5 mg/kg [0.68 mg/lb], q 24 h), and ranitidine (1.0 mg/kg [0.45 mg/lb], PO, q 24 h) for 1 week.
Tooth luxation is defined as a partial displacement of the tooth in a lateral direction (lateral luxation), or out of the alveolus (extrusive luxation).1 Lateral luxation is usually accompanied by comminution or fracture of the alveolus and laceration of the mucogingival tissues, as occurred in the dog of this report. Lateral luxation is the most commonly diagnosed type of periodontal injury of traumatic origin in dogs.2–4 Radiographic signs include widening of the periodontal ligament space and displacement of the lamina dura. These changes may not be visible depending on the angle of the x-ray beam and position of the radiograph.5–7 In our patient, the angle of the x-ray beam and the position of the radiograph allowed better visualization of the remaining periodontal ligament space and alveolus. The root fragment evident on CT was not easily visualized on dental radiographs. On reevaluation of the dental radiographs, the root fragment could be partially seen, but it may have been overlooked if the CT scan had not been performed. In dogs and cats, CT has been proven to be a superior modality for imaging of the skull, compared with radiographs.8 Combining dental radiography and CT scan findings can contribute to the diagnosis and treatment of maxillofacial and dental trauma.

Full-mouth radiography and CT often reveal unexpected and clinically important lesions that are not apparent during an oral examination. In the dog of the present report, the right maxillary canine tooth was luxated laterally and clinically appeared to be an appropriate candidate for tooth splinting.9 However, radiographic findings were indicative of a nonvital tooth, extensive inflammatory root resorption, and root fracture; therefore, extraction was performed rather than splinting. Although the type of tooth resorption can only be definitively identified through histologic examination,10 the radiographic appearance with blunting of the tooth root and replacement of the alveolar bone were supportive of external inflammatory resorption. External inflammatory resorption is characterized by a loss of dental tissues adjacent to areas with loss of alveolar bone secondary to inflammatory conditions (eg, endodontal disease, periodontal disease, or both).11,12 The frequency of this type of tooth resorption increases with age, which is consistent with the prevalent nature of endodontal and periodontal disease in adult dogs. Almost all endodontically compromised teeth have some degree of external inflammatory resorption.10

Treatment of this type of resorption is targeted to resolve the underlying disease process such as the extraction of the right maxillary canine tooth in the dog of this report. Together with a comprehensive oral and physical examination, both dental radiography and CT were beneficial for diagnosis and treatment planning in this patient.

Comments

Full-mouth radiography and CT often reveal unexpected and clinically important lesions that are not apparent during an oral examination. In the dog of the present report, the right maxillary canine tooth was luxated laterally and clinically appeared to be an appropriate candidate for tooth splinting.9 However, radiographic findings were indicative of a nonvital tooth, extensive inflammatory root resorption, and root fracture; therefore, extraction was performed rather than splinting. Although the type of tooth resorption can only be definitively identified through histologic examination,10 the radiographic appearance with blunting of the tooth root and replacement of the alveolar bone were supportive of external inflammatory resorption. External inflammatory resorption is characterized by a loss of dental tissues adjacent to areas with loss of alveolar bone secondary to inflammatory conditions (eg, endodontal disease, periodontal disease, or both).11,12 The frequency of this type of tooth resorption increases with age, which is consistent with the prevalent nature of endodontal and periodontal disease in adult dogs. Almost all endodontically compromised teeth have some degree of external inflammatory resorption.10

Treatment of this type of resorption is targeted to resolve the underlying disease process such as the extraction of the right maxillary canine tooth in the dog of this report. Together with a comprehensive oral and physical examination, both dental radiography and CT were beneficial for diagnosis and treatment planning in this patient.

References